studied the question on the spot, except de Saussure,[1] who was there some thirty years ago. He suggested that the swamps which extend between the water and the dry land prevented the creatures from gaining the latter and therefore from transforming. But thick rush-swamps fill only the north-western extent of the region. Then Weismann speculated upon the dismal condition of the salt-incrusted surroundings which were supposed to have hemmed in the Axolotl. This dream could apply only to Lake Texcoco, where there are none! The latest suggestion has been made by Herrera,[2] the professor of zoology in Mexico. He puts it categorically that the Axolotl cannot transform for want of food. Fancy the idea that overcrowding of the lakes, which are teeming with food, causes famine and at the same time produces big, oily, fat Axolotl!

The inducements to remain in the water, their birthplace, have become too strong for the larvæ to yield to their innate tendency of further development. Nothing is stunted in their bodies. On the contrary, they become to a certain extent overgrown, and the sexual organs, which anyhow in most terrestrial Urodela are active only during the temporary aquatic life, undergo their normal course of development and function. H. GADOW.

ISOMERIC CHANGE IN BENZENE DERIVATIVES.[3]

IN recent years, it has become realised that in many chemical reactions, isomeric changes—that is, the change of a given substance into another of identical composition, but possessing a different and under the conditions a more stable constitution—play an important part; thus, as is well known, from the salts of certain organic acids, the acid frequently cannot be obtained, but a neutral isomeride (the pseudo-acid) into which the acid changes is alone isolated. One very interesting instance of isomeric change is to be found in the process of substitution in certain benzene derivatives. As long ago as 1887, Armstrong suggested that the ready production of para-derivatives from amino- and hydroxy-aromatic compounds—anilines and phenols—was due to the formation initially of isomeric compounds in which the amino- or hydroxylic hydrogen was displaced by the substituting group. Since that date, these labile precursors (phenyl chloramines, nitramines, &c.) of the ordinary substitution products (chloro-, nitro-anilines, &c.) have been isolated in numerous cases. They can always be transformed into the stable isomeride, but this change seems to be conditioned by the presence of some other substance—the catalyst. As Armstrong has suggested, these isomeric changes are "fermentative" in character, often taking place with great facility and under the influence of minute amounts of the catalyst. Measurements of the velocity show that changes of this type are always apparently monomolecular (that is, each molecule changes *per se*); but such a result only proves that the slowest reaction is monomolecular and does not exclude the possibility of the simultaneous occurrence of other more rapid transformations, which form part of the complete change.

A most instructive example of isomeric change is found amongst diazobenzene derivatives. The diazobenzene salts are derived from the base, diazonium hydroxide, to which is now generally assigned the expression $Ph.N(OH){\equiv}N$. On treatment with alkalis, this base is converted into the salts (diazotates) of an isomeric acid, to which the formula $Ph.N{:}N.OH$ is given. On attempting to isolate the acid from these salts, a neutral isomeric substance (the pseudo-acid) is obtained; this is probably a phenylnitrosamine, $Ph.NH.NO$. In this paper, the author describes a new case of intramolecular change of a remarkably interesting kind:—Chloro- and bromo-benzenediazonium hydroxides, $C_6H_2X_3.N(OH){\equiv}N$, readily change into isomeric hydroxybenzene derivatives, $C_6H_2X_2(OH).NX{\equiv}N$, the hydroxyl group and one of the halogen atoms (an ortho-placed halogen atom) having exchanged positions. This change not only affords another illustration of the transference of a group from the side chain of an aromatic compound into the benzene nucleus, but further shows the tendency, which has been occasionally noticed, for an ammonium base to change into an isomeric substance of neutral character. Under all conditions, when it is possible for the diazonium hydroxide to be present, the wandering of the hydroxyl group takes place. Thus in dilute aqueous solution of such diazonium salts as the nitrate or the hydrogen sulphate, the small quantity of diazonium hydroxide which arises from hydrolytic dissociation undergoes this change. In the presence of excess of acid, there is no hydrolytic dissociation and consequently the isomeric change does not take place. In the case of the salt of a weak acid, as the acetate, where the hydrolytic dissociation is considerable, the rate of interchange of halogen for hydroxyl is greatly increased. In the naphthalene series, this intramolecular change occurs with even greater ease and rapidity than in the benzene series.

The elucidation of the nature of the process by which halogen is eliminated from diazobenzene compounds (a reaction first observed by Meldola in the naphthalene series) has rendered possible the removal of certain errors in the statements regarding the changes undergone by diazonium compounds. Thus Hantzsch has recently stated that *s*-tribromobenzenediazonium hydroxide, $C_6H_2Br_3.N(OH){\equiv}N$, changes into the corresponding phenyl nitrosamine, $C_6H_2Br_3.NH.NO$, not realising that under the conditions (presence of acetic acid) an isomeric change has taken place, bromine being eliminated.

A DAYLIGHT PHOTOMETER.

A "DAYLIGHT PHOTOMETER" described by Mr. A. H. Munsell, of Boston, Mass., is designed mainly for the comparison of the brightnesses of various coloured surfaces illuminated by daylight or artificial light. The instrument consists essentially of two "cat's-eye" shutters placed symmetrically towards a source of diffused light. Through one of these the light falls on the coloured surface to be tested, through the other upon a standard white surface. The second shutter is then gradually closed until the resulting grey produced on the white screen just matches the coloured surface in intensity, whilst a dial connected with this shutter shows, in percentage, how much darkening has been necessary to match the coloured surface under test. The instrument has also been applied to the testing of light transmitted through coloured media. Owing to the wide variation in the sources of light used, as well as in the colour perceptions of different observers, no degree of absoluteness can be attached to the readings. As Purkinje and Dove showed, the relative brightness of two differently coloured surfaces changes as the strength of the illuminating source is altered. But although the readings of the instrument must for these reasons be interpreted with great caution, the arrangement seems capable of supplying much interesting information on the variations of colour perception under different conditions. ALBERT CAMPBELL.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—It was agreed by the senate on January 29, by a large number of *placets* to one *non-placet*, to appoint two additional demonstrators of human anatomy.

The funeral service for the late Master of Caius, Dr. N. M. Ferrers, F.R.S., took place privately in the college chapel yesterday, February 4. The public service for the late Sir G. G. Stokes, F.R.S., Master of Pembroke, is to be held in St. Mary's Church to-day, and will be attended by a large number of members and officers of the University and representatives of learned societies.

By the will of the late Mr. F. J. Quick, of Trinity Hall, the residue of his estate, valued at some 50,000*l.*, is placed in trust for the promotion of study and research in vegetable and animal biology. The University is to draw up a scheme for the administration of the trust, wherein it shall be provided that no office or appointment paid from the income of the fund shall be held by the same person for more than three years without being thrown open for a fresh election.

The election to the Lucasian professorship, vacant by the death of Sir G. G. Stokes, will take place at noon on February 28. The electors are the heads of colleges.

Miss I. Sollas, Newnham College, has been nominated to

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[1] *Verhandl. Schweizer naturforsch. Gesellsch. Einsiedeln* (1868), p. 89.

[2] *La Naturaleza*, 2nd ser., vol. iii. (May, 1900).

[3] Abstract of paper on "Isomeric Change in Benzene Derivatives—The Interchange of Halogen and Hydroxyl in Benzenediazonium Hydroxides." By Dr. K. J. P. Orton. Read before the Royal Society December 4, 1902.

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occupy the University table at the Plymouth Marine Biological Laboratory.

Dr. W. N. Shaw, F.R.S., is to lecture on Thursdays during the present term on the physics of the ventilation of buildings. The lectures are given in the Cavendish Laboratory at 4.30 p.m.

The Arnold Gerstenberg studentship, value 90*l.* for two years, will be awarded in the Lent term, 1904. It is open to men and women who have obtained honours in the natural sciences tripos and propose to pursue philosophical study. The award will be made by means of essays on subjects set forth in the *University Reporter* (p. 431).

DR. G. N. STEWART, of Cleveland, U.S.A., has been offered and has accepted the professorship of physiology in the University of Chicago.

SPEAKING at a meeting of the Derbyshire Dairy Farmers' Association at Derby, on January 30, the Duke of Devonshire said he did not know what our educational system, as it had too generally been administered in the past, had done for the advantage of the farmers. They had seen it mainly from this point of view—that it had taken the best and brightest boys and girls from the country districts away to employment in the towns, and that it had done nothing to improve the character of the labour which was still left to them in the country. The education which the children received in rural districts might have been such as to fit the children for occupations in towns in various branches of industry, but it had not been such as to make a boy or a girl a better member of the agricultural community. What they wanted was, first, to form the character of the children, to make them honest, industrious, more reflecting and steadfast; and, next, to improve their intelligence so that they might be more capable of doing whatever class of work might fall to their lot in life in a better, more conscientious and intelligent manner. The village school which did not have this effect upon the children was not a school conducted as it ought to be. What was wanted for the children was not the cramming of them with facts, but teaching them something which might be applied to their daily life and might so interest them that they would prosecute its study after they left school and thus fit themselves more effectively for their daily labour, whether it were in the town or in the country. The training of their teachers had hitherto been too exclusively of a literary character, with, perhaps, a scientific smattering. It had not been directed to those subjects which related to agricultural life, to farming, dairying or the household.

IN proposing the toast of "The Mining and Metallurgical Industries," at the 30th annual dinner of the Royal School of Mines on Tuesday, the chairman, Mr. A. C. Claudet, referred to the steps that had been taken by the council of the Institution of Mining and Metallurgy with a view to effect the reorganisation of the Royal School of Mines. The *Times* reports Mr. Claudet to have said that, in the interests of the Empire no less than of the mining and metallurgical industries, prompt and far-reaching action was imperatively necessary if British-trained mining engineers and metallurgists were to hold their own in the future with foreign-trained engineers, and it was this conviction which led the council of the institution to take the matter in hand. Systems in force in America and elsewhere had been investigated, and the results communicated to the council of the college, with certain recommendations and the offer of material assistance in carrying them out. The matter was receiving the serious attention of the Board of Education, and the council of the institution had good grounds for feeling confident that comprehensive improvements would be effected at no distant date. It was believed that, if nothing unforeseen happened, British mining and metallurgical students would soon have facilities for training equal to the best in the world. The institution council proposed that a post-graduate course in practical work in mines and works at home or abroad should be established, and they had offered to give very material assistance in providing the necessary facilities for such a course on lines which they believed would be of the greatest possible benefit to British graduates. In connection with this post-graduate course the institution had presented scholarships to the Royal School of Mines, and to three or four other colleges as a beginning, and it was hoped that before long further scholarships and prizes would be available. The endowments and grants by Government in connection with mining and metallurgical training in this country were, as every one knew, ridiculously inadequate, and out of proportion to the vast interests involved—interests not merely local, but affecting the whole British Empire. However, there were many signs that the Government and other authorities were alive to the necessity of doing something promptly for this branch of education, and if they pressed their claims strongly and persistently he had no doubt at all that they would be met in a satisfactory manner. There was every reason to believe that their school would again occupy the position it once held, and ought still to hold—that of the premier mining school of the Empire, and second to none in the world.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 22.—"On the Electrodynamic and Thermal Relations of Energy of Magnetisation." By Dr. J. **Larmor**, Sec.R.S.

The main points which the author has sought to bring out in this paper are as follows:—

(1) In an electrodynamic field, there exists the usual specification of electrokinetic energy, but also *in addition* the energy of magnetisation of magnetic material.

(2) This energy of magnetisation appears as made up of a part given by the ordinary formula, which (when paramagnetic) is derived from thermal sources, and so in the absence of hysteresis has the limited mechanical availability of thermal energy, together with a local part which is to some extent thus available, but is also in part permanent intrinsic energy of the molecules, regarded temporarily as magnetic energy.

(3) The law of Curie, that the susceptibility of weak paramagnetic substances is inversely proportional to the absolute temperature, is involved in these statements.

(4) The extent of the direct (non-thermal) availability of *retained* magnetism can be inferred only by empirical procedure, for example, in general features by inspection of the hysteresis diagram as pointed out by Lord Rayleigh.

Physical Society, January 23.—Prof. S. P. Thompson, president, in the chair.—A paper on an oscillating table for determining moments of inertia was read by Mr. W. H. **Derriman.** The apparatus consists of a circular wooden table which can be suspended from a wire by means of brass supports. A pointer is attached to the centre of the bottom of the table and immediately below is another fixed pointer. In the top of the table a circular groove is cut, in which pieces of lead can slide. These pieces of lead form together half of a circular ring of rectangular cross section. The body, the moment of inertia of which is required, is placed in position on the table, and the lead weights moved until the two pointers are opposite to one another. The table therefore always oscillates about the same axis, and since the lead weights are at a fixed distance from this axis, the moment of inertia of the table remains constant. The apparatus can be employed for determining the moment of inertia of a body about any axis, and is useful for proving the law that the moment of inertia of a body about any axis is equal to its moment of inertia about a parallel axis through its centre of gravity, together with the moment of inertia of the whole mass, collected at its centre of gravity, about the given axis.—Mr. **Skinner** described an inertia balance by means of which moments of inertia can be determined without the use of stop watches. The table which carries the body is suspended by a wire. Fixed to the centre of the bottom of the table there is another wire, similar to the first, but twice as long. This wire carries a screwed brass bar, the axis of the bar being at right angles to the wire. At the middle point of this wire there is a pointer fixed at right angles to it, and on the brass bar are two weights which can be placed at varying distances from the axis. To the bottom of the bar is attached a fourth wire, the same length as the first one, and its lower end is clamped. By arranging so that the upper table oscillates to the left when the bar is oscillating to the right, and adjusting the weights on the brass bar until the pointer is stationary, the moments of inertia of bodies placed upon the table can be determined. The chairman referred to an inertia table designed by Prof.

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